



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

Bartlett Hooper ..	2	2	0	Thomas Lloyd, Birmingham ..	2	2	0
F. Richardson ..	1	1	0	Messrs. Elkington and Mason, Birmingham ..	5	5	0
J. Sharples ..	3	3	0	Messrs. John Hardman and Co., Birmingham ..	2	2	0
Henry Johnson ..	2	2	0	Messrs. F. and C. Osler, Birmingham ..	5	5	0
C. Skipper, jun. ..	1	1	0	The Proprietors of the <i>Birmingham Journal and Daily Post</i> ..	2	2	0
G. T. Saul ..	1	1	0	The Proprietors of the <i>Birmingham Gazette</i> ..	2	2	0
Alderman D. H. Stone ..	5	5	0	R. L. Chance, Birmingham ..	2	2	0
G. H. Walker ..	1	1	0	T. Avery, Birmingham ..	2	2	0
R. Worthington ..	2	2	0	W. Tonks and Sons, Birmingham ..	2	2	0
A. W. Miles ..	2	2	0	W. Lucas Sargent, Birmingham ..	2	2	0
J. Harris Heal ..	2	2	0	— Mountain (Messrs. Walter, May, and Co.), Birmingham ..	2	2	0
John Bell ..	1	0	0	J. A. Williams, Birmingham ..	2	2	0
Messrs. Mander and Co. ..	2	2	0	Henry Charlton, Birmingham ..	2	2	0
B. S. Cohen ..	1	1	0	W. Bartlett and Sons, Birmingham ..	5	0	0
John Corbett ..	1	1	0	John P. Turner, Birmingham ..	0	10	6
J. Zaehnsdorf ..	0	10	0	W. H. Avery, Birmingham ..	2	2	0
Major-General Viscount Templetown, C.B. ..	5	0	Messrs. Peyton and Peyton, Birmingham ..	3	3	0	
J. Pearce ..	3	3	0	James Cartland, Birmingham ..	2	2	0
Messrs. Huntley and Palmer ..	2	2	0	Messrs. Smith and Chamberlain, Birmingham ..	2	2	0
A. Glendining, jun. ..	1	1	0	Messrs. Baker and Son, Birmingham ..	2	2	0
A. Trevelyan ..	2	2	0	Messrs. Hinks and Wells, Birmingham ..	2	2	0
S. Harrington ..	1	1	0	Messrs. Van Wart and Co., Birmingham ..	5	0	0
Montague Ainslie ..	2	2	0	Messrs. Evans and Askin, Birmingham ..	2	2	0
James Bentley ..	2	2	0	C. Shaw, Birmingham ..	2	2	0
Capt. R. P. Oldershaw ..	1	0	James Barwell, Birmingham ..	1	1	0	
E. C. Tufnell ..	2	2	0				
Samuel Redgrave ..	1	0					

Collected in response to a Circular issued by the Birmingham Chamber of Commerce.

G. Dixon, Mayor of Birmingham ..	5	5	0
Messrs. Smith and Wright, Birmingham ..	5	5	0
Messrs. Griffiths and Browett, Birmingham ..	5	5	0
Henry Weiss, Birmingham ..	2	2	0
W. H. M. Blews, Birmingham ..	2	2	0
W. Middlemore, J.P., Birmingham ..	5	5	0

Subscriptions may be forwarded to the Financial Officer, at the Society's House.

The Council are now prepared to receive the names of any workmen recommended by their respective trades as fit and proper persons to undertake this important duty on behalf of their fellow workmen.

PROGRAMME OF EXAMINATIONS FOR 1868.

PRELIMINARY NOTICE.

I. The Examinations described herein have been established for the benefit of the members and students of Institutions in Union with the Society of Arts. Such persons are commonly mechanics, artisans, soldiers, * labourers, clerks, tradesmen and farmers in a small way of business, apprentices, sons and daughters of tradesmen and farmers, assistants in shops, and others, of various occupations, who are not graduates, undergraduates, nor students of a University, nor following nor intending to follow a learned profession, nor enjoying nor having enjoyed a liberal education. To all such members and students in the Institutions, and to other persons of the like condition, male and female, the Examinations, certificates, and prizes, described in this programme, are open on the general conditions stated herein. Persons, however, who are, or have been, professional teachers or pupil teachers; persons who either are enjoying or have enjoyed a liberal education, or who occupy a higher position in society than those above described, may obtain certificates, but cannot compete for the prizes, of which particulars are given at pages 565 and 566.

II. The certificates are not competed for. They are

* The following circular memorandum (Gen. No. 331), addressed to the army at home, has been issued:—"Miscellaneous 1 (1865).—The Field Marshal Commanding-in-Chief desires it to be notified that there will be no objection to soldiers, their wives, and families, being permitted to present themselves for instruction and examination at the Educational Institutes in connection with the Society of Arts, on the understanding that they are not on that account to be exempt from any military duty, nor, except in special cases, to be out of barracks after watch-setting or tattoo.—By command of his Royal Highness the Field Marshal Commanding-in-Chief, JAMES YORKE SCARLETT, Adj. Gen.—Horse Guards, S.W., 11th March, 1866."

awarded as records of positive, not comparative, attainment. The prizes are competed for.

III. For the conditions on which persons of a higher grade in society may be examined and receive certificates, but not compete for prizes, see paragraph 4 (D).

IV. The Candidates for Examination have not to go to a distance from their homes. The Examinations are held in all places in the United Kingdom where a Local Educational Board connected with the Society of Arts is willing to make the requisite arrangements.

V. For a list of the Local Boards already formed, see page 566.

VI. For instructions as to the formation of Local Boards and their duties, see page 559.

The EXAMINATIONS are—

- (1.) The Previous Examinations by District Unions and Local Boards for ascertaining the fitness of Candidates to present themselves at the Final Examination.
- (2.) The Final Examination by the Society of Arts Board of Examiners, under the supervision of the Local Boards.

PREVIOUS EXAMINATIONS BY DISTRICT UNIONS AND LOCAL BOARDS.

1. The object of these Examinations is to "sift" the Candidates for the Final Examinations, so as to keep back (1) those who are not fairly grounded in the elements of education—spelling, writing, and arithmetic—and (2) those who are not fairly acquainted with the subject or subjects in which they desire to be examined by the Society of Arts, and are therefore unlikely to succeed in

that Examination. The sifting in the above-named elementary subjects may be effected at the discretion of the Local Boards; they should examine their Candidates in spelling and writing by dictating to them a passage from an English author for them to write down; in arithmetic by setting them moderately easy questions to work out in the usual manner. The best mode of sifting the Candidates in the special subjects in which they desire to be examined by the Society of Arts is for the Local Boards to examine them therein by means of printed (or written) questions and written answers; but, where a Local Board finds itself without the means of conveniently holding such an Examination in any special subject, such Board may satisfy itself in any other mode, and state simply that it has satisfied itself, that the Candidate is fit to be examined by the Central Board in that subject.

2. The Previous Examinations must be held sufficiently early in the year to enable the proper returns to be made, as explained in par. 6.

FINAL EXAMINATION BY THE SOCIETY OF ARTS.

3. No Candidate can be admitted to the Final Examination unless duly returned by a District Union or Local Board as having passed a Previous Examination.

4. Every admitted Candidate must be at least 16 years of age.

(A.) Members of, or students of classes in, Institutions in Union with the Society of Arts, are examined Free.

(B.) Members of, or students of classes in, Small Institutions,* not in Union with the Society of Arts, but subscribing one guinea a year for admission to the Examinations alone, are examined Free.

(C.) Members of, or students of classes in, "Small Institutions"** not in Union with the Society of Arts, but connected with it through a District Union or Local Board, are examined on payment of a fee of 2s. 6d.

N.B.—It will be understood that Candidates coming under the heads (A), (B), or (C) must not be of a higher class in society than those described in par. I. of the Preliminary Notice.

(D.) Persons of a higher class of society than those described in paragraph I. (Preliminary Notice), cannot compete for prizes, but may be examined for certificates on payment of a fee of 5s.

5. The Council in every case require the Local Boards to certify whether a Candidate should pay this higher fee; and it is earnestly hoped that in any instance where a Local Board has reason to believe that a Candidate is or has been a teacher, or that he or his parents occupy such a position in society, or are in such easy pecuniary circumstances as to disqualify him, according to the regulations, for competing for a prize, they will at once, in case of certainty, return him as not competing for a prize, or in case of doubt, communicate with the Secretary of the Society of Arts.

6. A copy of Form No. 2 will be forwarded to the Secretary of each Local Board, and must be filled up and returned to the Secretary of the Society of Arts before the 12th of March. The requisite number of forms No. 4 will then be forwarded, and these, when filled up, must be returned not later than the 30th of March. Each of these forms, when returned, will be numbered at the office of the Society of Arts, and a card for each candidate, with his name and his number, will afterwards be forwarded to the Secretary of the Local Board for distribution, together with copies of the time-table.

7. The printed papers of questions in the various subjects will be afterwards forwarded to the Secretary of the

* Small Institutions are defined as those which have an income of less than £75 a year.

Local Board; details as to the mode in which the Final Examination is to be conducted are contained in the Letter of Instructions (Form No. 6), and members of the Local Boards should make themselves thoroughly acquainted with them.

8. When the Candidates' papers have been submitted to the judgment of the Society's Examiners, certificates of three grades will be awarded, and the names of the Candidates who obtain prizes and certificates will be afterwards published in the *Journal of the Society of Arts*.

9. A Candidate who has obtained from the Society a certificate of the 1st class in any subject cannot again be examined in the same subject; but a Candidate who has obtained a certificate of the 2nd or 3rd class may, on the recommendation of the Local Board, be examined in the same subject, in a subsequent year, without again passing the Previous Examination.

10. A Candidate who, having obtained a certificate in any subject, desires to be examined in some other subject, in a subsequent year, may be "passed" by the Local Board, after an examination in that subject, without re-examination in the elementary subjects; but, in all cases, the name must be returned in the proper form.

11. Particulars of the subjects for the Final Examination are given below.

12. The Time-table has been drawn up to meet the general convenience of the Candidates; and *no variation* of it can *possibly* be allowed, so that, in choosing the subjects in which they desire to be examined, Candidates must take notice of the arrangements of this Time-table, as they *cannot* be examined in two subjects which are set down for the same evening. The days and hours of Examination must be *strictly* adhered to.

13. The Examiners will reject all ill-written, ill-spelt, ill-composed, or ungrammatical papers that may be laid before them.

TIME-TABLE FOR 1868.

TUESDAY, 21st April, From 7 to 10 p.m.	WEDNESDAY, 22nd April, From 7 to 10 p.m.	THURSDAY, 23rd April, From 7 to 10 p.m.	FRIDAY, 24th April, From 7 to 10 p.m.
Arithmetic.	Book-keeping.	Algebra.	Geometry.
Trigonometry.	Navigation.	Practical Mechanics.	Mensuration.
Electricity and Magnetism.	Conic Sections.	Animal Physiology.	Principles of Mechanics.
Light and Heat.	Chemistry.	Political and Social Economy.	Botany.
Mining and Metallurgy.	Music.	French.	Geography.
Geometrical Drawing.	Domestic Economy.	Italian.	Latin.
German.	English History.	Fruit and Vegetable Culture.	Logic and Mental Science.
Floriculture.		Freehand Drawing.	Spanish.

† Two papers of one hour and a half each in this subject are considered as one.

LOCAL EDUCATIONAL BOARDS.

14. Local Boards may be formed wherever the managers of Institutions, or other persons, may be prepared to co-operate with the Society of Arts.

15. Each Local Board must consist of at least three members, and must have a Chairman and a Secretary. The district for which the Board is to act should be defined, and the composition of the Board must be such as to command the respect and confidence of the neighbourhood. No member or officer of a Local Board can be admitted to examination.

16. The duties of the Local Boards may be defined as follows:—

(A.) To give publicity to the system of Examinations by the circulation of the programmes, hand-bills, &c. (copies of which will be furnished *gratis* on application), and to give encouragement and advice to those young persons who are likely to become candidates.

(B.) To hold the Previous Examinations.

(C.) To superintend the Final Examinations.

17. Local Boards make no payment to the Society, unless they exercise the power of admitting candidates who are not members of any Institution in Union with the Society of Arts (see par 4 C.); in which case a subscription of one guinea a year must be paid.

18. A detailed list of each Local Board (giving the exact address of the Secretary) must be submitted to the Council of the Society of Arts before the 1st of February, 1868, when the general list of such Boards will be published; and where a Local Board comprises so large a district that, for the convenience of the candidates, Branch Local Boards have to be formed, lists of these must also be given. All changes in the composition of the Boards must be notified to the Society of Arts.

19. N.B.—Local Boards may also usefully direct their attention to the holding of Preparatory Examinations in Elementary Subjects, either upon the system described at page 16, or upon any other system that they may prefer.

SUBJECTS FOR THE FINAL EXAMINATION IN 1868.

20. In the following paragraphs will be found brief outlines of the subjects in which candidates may be examined, and their attention is especially drawn to this part of the Programme. In many instances the Examiner has set down certain Text-books; but, in most cases, a candidate may exercise his own judgment as to what Text-book he uses; real knowledge, however or wherever acquired, will be accepted by the Examiners. In the following subjects, however, Political Economy, English History, English Literature, Logic, Latin and Roman History, French, German, Italian, and Spanish, the course of study is necessarily prescribed with more or less exactness.

I.—ARITHMETIC.

Examiner.—Rev. Alexander Wilson, M.A., National Society, London.

21. Practice—Simple and Compound Proportion—Interest—Discount—Insurance—Vulgar and Decimal Fractions; with the principles of a Decimal Notation in money on the basis of the pound unit.

22. The questions framed from the preceding syllabus will consist mainly of practical problems, and the Examiner will take into account not only the correctness of the answers, but also the excellence of the methods by which they are worked out, and the clearness and neatness of the working, *which must always be shown*.

23. Text Books:—Any of the modern treatises on Arithmetic, such as Hunter's Text Book (*National Society*), Colenso (*Longmans*), or Barnard Smith (*Macmillan*).

II.—BOOK-KEEPING BY DOUBLE ENTRY.

Examiner.—John Ball, Esq., of the firm of Messrs. Quilter and Ball, and Robert G. C. Hamilton, Esq., Principal Accountant to the Committee of Council on Education.

24. Candidates should be prepared to answer questions as to the nature and use of the different books usually kept in a merchant's office; to journalise a series of transactions from a waste book, and having posted the entries to the ledger, to balance the accounts, to prove the correctness of the postings by a trial balance, and finally to exhibit an account of profit and loss, and a balance sheet.

25. Text Books:—Rudimentary Book-keeping (*Weale's Series*). Kelly's Elements of Book-keeping (*Simpkin and Co.*). Examination-Questions in Book-keeping by Double Entry, by the Rev. J. Hunter, M.A. (*Longmans*).

III.—ALGEBRA.

Examiner.—Rev. T. P. Hudson, M.A., Fellow and Tutor of Trinity College, Cambridge.

26. Elementary Operations and Fractions, Simple and Quadratic Equations and Problems leading to them. Involution and Evolution. Surds. Arithmetical, Geo-

metrical, and Harmonic Series. Combinations and Permutations. Binomial Theorem. Scales of Notation. Interest and Annuities. Elementary Theory of Probabilities.

27. Text Books:—Todhunter's Algebra (*Macmillan*), Colenso's Algebra (*Longmans*), Lund's or any other modern treatise on Algebra.

IV.—GEOMETRY.

Examiner.—Rev. B. Morgan Cowie, M.A., Professor of Geometry at Gresham College; one of H.M. Inspectors of Schools.

28. To obtain a first-class certificate, at least six problems and four propositions must be correctly done; to obtain a second-class, at least four problems and six propositions.

29. Text Books:—Euclid, Books I., II., III., IV., VI., XI., as far as Prop. 21. Potts' smaller edition (*Parker*). Green's Euclid's Plane Geometry, practically applied, is a useful help to those who are studying by themselves (*Heywood*, Manchester; *Simpkin, Marshall, and Co.*, London).

V.—MENSURATION.

Examiner.—John Sykes, M.A., Assistant-Secretary to the Committee of Council on Education.

30. The calculation of the areas and circumferences of plane figures bounded by arcs of circles or right lines, and solid contents of cones, cylinders, spheres, &c. Candidates will be expected to be familiar with the different rules for measuring and estimating artificers' work, such as joiners', bricklayers', masons', and plumbers' work, and to be able to prepare estimates of such work from given quantities.

31. Text Books:—Lund's Mensuration, Part III. of his Elements of Geometry and Mensuration. Tate's Mensuration. Young's Treatise on Mensuration (*Simms and M'Intyre*).

32. The Examiner, in speaking of last year's work, says:—"There are, as usual, several cases in which the working ought to have had more explanation."

VI.—TRIGONOMETRY.

Examiner.—Rev. T. G. Hall, M.A., Professor of Mathematics in King's College, London.

33. In Plane Trigonometry, the formulas for the trigonometrical functions of angles, the numerical solution of plane triangles, the use of logarithmic tables, and angular and exponential series.

34. Spherical Trigonometry, Napier's Rules, and the Solution of Spherical Triangles.

35. Text Books:—Snowball's or Todhunter's Trigonometry, Trigonometry for Schools, and for Spherical Trigonometry (*Christian Knowledge Society*), or any other of the modern treatises on Trigonometry. Mathematical Tables (*Chambers' Series*).

VII.—CONIC SECTIONS.

Examiner.—Rev. Bartholomew Price, M.A., F.R.S., Sedleian Professor of Natural Philosophy in the University of Oxford.

36. The properties of the three curves treated geometrically; also as deduced from the cone. The principles of projection, orthogonal and central, applied to derive the properties of the conic sections from those of the circle.

37. Analytical Conics, including the equations of the straight line, the circle, the three conic sections, and the general equation of the second degree.

38. Text Books:—Drew's Conic Sections (*Macmillan*). Taylor's Conic Sections (*Macmillan*). Salmon's Conic Sections (*Longmans*). Todhunter's Conic Sections (*Macmillan*).

VIII.—NAVIGATION AND NAUTICAL ASTRONOMY.

Examiner.—Rev. Joseph Woolley, LL.D., Director of Education for the Admiralty, and Inspector-General, Royal School of Naval Architecture and Marine Engineering, South Kensington Museum.

39. A good knowledge of Plane and Spherical Trigonometry, of the definitions and terms used in Nautical Astronomy, and of the various measurements of time and

their mutual conversions will be required, as well as skill in the use of logarithmic tables, and neatness, order, and accuracy in the numerical solutions of problems.

40. The candidate should understand the construction of charts; the nature and laws of circular storms; great circle sailing, &c.; the methods of determining the latitude, longitude, variation of the compass, and error and rate of a chronometer by astronomical observations, with the demonstrations of the formulae employed; the use of nautical astronomical instruments, &c.

41. Text Books:—The Nautical Almanac (*Murray*). Riddle's Navigation and Nautical Astronomy (*Law, Essex-street*).

42. N.B.—Candidates in this subject should be allowed the use of the Nautical Almanac and Tables *during the Examination*.

IX.—PRINCIPLES OF MECHANICS.

Examiner.—Rev. Jonathan Bates, M.A., late Fellow of Gonville and Caius College, Cambridge.

43. The properties of matter, solid, fluid, and gaseous.

44. Statics: The composition, resolution, and equilibrium of pressures acting on a material particle, and on constrained particles; machines; attractions.

45. Dynamics: The laws of motion; impact, projectiles; constrained motion; central forces; oscillation.

46. Rigid Dynamics: Motion of a rigid body about a point;—of a free rigid body;—of a system of rigid bodies.

47. Hydrostatics: Pressures of fluids; equilibrium of floating bodies; specific gravity; elastic fluids; machines; temperature and heat; steam; evaporation.

48. Hydrodynamics: Motion and resistance of fluids in tubes, &c.; waves and tides.

49. Pneumatics: Mechanical properties of air; the barometer, and other machines illustrating the mechanical properties of air.

50. Text Books:—Todhunter's Statics, or Parkinson's Mechanics. Goolwin's Mathematics. Miller's, Phear's, or Besant's Hydrostatics. Webster's Theory of Fluids. The treatises on these subjects in Orr's Circle of the Sciences. Golding Bird's Elements of Natural Philosophy, by C. Brooke (*Churchill*). Lardner's Handbooks on Natural Philosophy. Tate's Examples in Mechanics. Baker's Statics and Dynamics (*Weale's Series*). Twiss's Practical Mechanics. Rankine's Applied Mechanics.

X.—PRACTICAL MECHANICS.

Examiner.—T. M. Goodeve, Esq., Professor of Mechanics at the Royal Military Academy, Woolwich.

51. The applications of the principles of Mechanism to Simple Machines. The Steam Engine.

52. Text Books:—Bourne's Catechism of the Steam Engine (*Longmans*). Scott Russell on the Steam Engine. Nasmyth's Elements of Mechanism, with remarks on Tools and Machinery (*Weale*). Goodeve's Elements of Mechanism, second edition (*Longmans*).

XI.—MAGNETISM AND ELECTRICITY.

Examiner.—Charles Brooke, Esq., M.A., F.R.S., Pres. M.S.

53. Construction and Properties of Magnets; Magnetic Instruments; Terrestrial Magnetism; The Mariner's Compass and its deviations in iron ships; Diamagnetism.

54. Franklin's Electricity; Voltaic Electricity; Electro-dynamics; Electro-telegraphy; Electro-metallurgy; Thermo-Electricity; Organic Electricity.

55. Text Books:—Elements of Natural Philosophy, by C. Brooke (*Churchill*). Lardner's Handbooks of Natural Philosophy (*Walton and Maberly*). Jamin, Cours de Physique, Becquerel, Traité de l'Électricité et de Magnétisme.

XII.—LIGHT AND HEAT.

Examiner.—Richard Potter, Esq., A.M., late Professor of Natural Philosophy and Astronomy in University College, London.

56. What is the sense of sight?—ancient theories—modern definitions and hypotheses of the nature of light

—the especial privileges of animals which possess organs of vision—the simple laws or properties of light required to be known before we can discuss the structure of the eye, and the construction of telescopes, microscopes, and other optical instruments—what are foci of pencils of rays—how formed by reflection and refraction—real and virtual foci—optical images real and virtual—how do they occur in optical instruments.

57. Why do we distinguish between Physical and Geometrical optics?—what are double refraction of light—polarisation of light—interference of light—examples of these properties, how shown—phenomena of recurring colours—examples—how are explained the colours of the soap bubble—the colours seen on looking towards a light through the feathers of small birds—the colours of mother-of-pearl—the rainbow, &c., &c.—the laws of the interference of polarised light—to describe cases of these splendid phenomena.

58. What are the definitions of heat, radiant, latent, and sensible?—what is meant by caloric?—hypotheses of the nature of heat—capacity of bodies for heat—the temperature of bodies—how measured by instruments—descriptions of thermometers and pyrometers—the scales of thermometers—how compared—how the volumes of solids, liquids, and gases depend on their temperature—absolute zero of cold—elastic force of vapours and gases produced by heat employed in steam and air engines—winds from the unequal heat of the atmosphere. What are the connections and analogies of heat and light?

59. Text Books:—The Library of Useful Knowledge. Brewster's Optics (Cabinet Cyclopaedia). Potter's Physical Optics, the descriptive and experimental treatise or first part (*Walton and Maberly*).

XIII.—CHEMISTRY.

Examiner.—A. W. Williamson, Esq., F.R.S., Professor of Chemistry, University College, London.

60. Preparation and properties of the chief gases, acids, bases, and salts. Laws of combining proportion by weight and by volume. Analytical processes for the detection and separation of metals, acids, &c. Preparation and distinctive properties of the chief kinds of alcohol, of organic bases, fixed and volatile organic acids, sugars, woody fibre, starch, &c.

61. Candidates are expected to be able to explain chemical reactions by the use of symbols. Questions illustrative of general principles will be selected from the following, amongst other manufactures:—Metallurgy of lead, iron, and copper; bleaching, dyeing, soap-boiling, tanning; the manufacture of coal-gas, sulphuric acid, soda-ash, &c.

62. Text books:—Miller's Elements of Chemistry, Williamson's Chemistry for Students.

63. The Examiner, in speaking of last year's work, says:—"Many of the papers leave a good deal to be desired in the way of accuracy. Teachers of chemistry are apt to include in their courses of instruction a wide range of facts than their pupils can thoroughly master. Each step in the study of the science ought to be firm and clear, and even the very first steps ought to be samples of accuracy and clearness."

XIV.—MINING AND METALLURGY.

Examiner.—J. Arthur Phillips, Esq., Civil Engineer, Graduate of the Imperial School of Mines of France, &c.

64. Candidates should be able to identify with facility the ores of the more common metals, and be acquainted with their chemical composition. They should also be familiar with the forms of occurrence of the various metallic ores, and the usual methods employed for their extraction and subsequent purification by crushing, stamping, washing, &c. Underground surveying, the principles of ventilation, particularly as applicable to collieries; a knowledge of furnace assaying, and a general acquaintance with the metallurgy of the more important metals are also required.

65. First-class certificates can be given to those only

who have either acquired some practical knowledge of mining, or who possess a special acquaintance with the metallurgy of at least one of the useful metals.

66. Text Books:—Dana's *Mineralogy* (*Trübner and Co.*, Paternoster-row). Mitchell's *Assaying* (*Bailliére*). Manual of Metallurgy (*Griffin*). Useful Metals and their Alloys (*Houlston and Wright*). Ure's *Dictionary of Arts, Manufactures, and Mines* (*Longmans*). Percy's *Metallurgy* (*Longmans*). Metallurgy of Iron, Truran (*Spon*). Mining and Metallurgy of Gold and Silver (*Spon*).

XV.—BOTANY.

Examiner.—Daniel Oliver, Esq., F.R.S., F.L.S., Keeper of the Herbarium at the Royal Gardens, Kew, and Professor of Botany in University College, London.

67. Sect. I.—The Structure of Plants and Vegetable Physiology. The Functions of the Various Organs, and their Morphological Relations. The Nature of the Principal Tissues. The meaning of Botanical Terms. The application of Structural and Physiological Facts to Practical Purposes.

68. Sect. II.—Systematic Botany: The general Principles upon which the Classification of Plants is based. The distinctive characters of the principal British Natural Orders of Plants. Naming Common Wild Flowers at Sight. The sources of the most important Economic Vegetable Products:—Timbers, Fibres, Fruits, Drugs, &c.

69. Sect. III.—Descriptive Botany. The Art of Describing Plants correctly in Scientific Language.*

70. Text Books:—Lindley's *School Botany* (*Bradbury and Evans*). Oliver's *Lessons in Elementary Botany* (*Macmillan*). Lindley's *Theory and Practice of Horticulture* (*Longmans*). Oliver's *Guide to the Kew Museums* (pamphlet) (*L. Reeve and Co.*).

71. Candidates will be expected to return three correct answers to questions in Section I., three in Section II., and at least two of the plants must be described and referred to their respective natural orders in Section III.

72. Students are very strongly recommended to the frequent practice of describing plants; at first on forms or "schedules," as given in Professor Oliver's "Lessons," page 59, and, when sufficiently advanced, in detail, as in the examples given at page 298 of the same work, and in Dr. Lindley's "School Botany."

XVI.—FLORICULTURE.

Examiner.—Thomas Moore, Esq., F.L.S., Curator of the Botanic Gardens, Chelsea, and Floricultural Director of the Royal Horticultural Society.

73. The leading Flowers of the different seasons, and how obtainable, whether by natural or artificial means, and under what modes of treatment.

74. Special Culture—Ferns, Orchids, Cacti, Heaths, Hardy Annuals, Bedding Plants.

75. Practical Operations.—Potting, Planting, Pruning, Training, Watering, Shading, Ventilating.

76. Flower-garden.—Pleasure-ground and shrubbery planting, materials for;—Flowering plants; Foliage plants. Sub-Tropical gardening. Geothermal culture. Lawns, formation and management of.

77. Flowering: how to induce or prevent by cultural agency. Influence of treatment on the formation and development of buds—leaf buds and blossom buds. Action of light on plants. Flower forcing.

78. Propagation.—The various modes of, and their special adaptations. Composts for different classes of plants. Acclimatization. Improvement or ennobling of races. Hybridization and cross-breeding.

79. Construction and warming of houses for plant culture. Atmospheric condition of plant houses. Influence of ventilation on plants grown in glass-houses. Ward's cases.

80. Text Books:—Lindley's *Theory and Practice of Horticulture* (*Longmans*). McIntosh's *Book of the Garden*

(*Blackwood and Sons*). Thomson's *Gardener's Assistant* (*Blackie and Son*).

81. The Examiner, in speaking of last year's work, repeats the recommendation before made, that "candidates should, as a part of their studies, practice the writing out of short pithy remarks on each of the subjects set down in the programme, comparing their own remarks with the statements in the text books, and repeating this from time to time, cutting out all superfluous words, so that they may get the essential particulars well impressed on the memory, and at the same time acquire a clear and condensed style of writing."

XVII.—FRUIT AND VEGETABLE CULTURE.

Examiner.—Robert Hogg, Esq., LL.D., F.L.S.

82. Sect. I.—Fruit-Tree Culture.—Kinds of Fruits adapted for various soils and exposures. The Propagation, Pruning, and Training of Fruit-trees. The Structure and Functions of the Organs of Trees, considered in their relation to growth and reproduction. The Forcing of Fruit-trees, and their Cultivation under glass, both in and out of pots. The Theory of Ripening, and the Principles that ought to Regulate the Preservation of Fruits after they are Ripe or their subsequent Maturation. The Packing of Fruit for transmission to great distances.

83. Sect. II.—Vegetable Culture.—The kinds and quantities of vegetable seeds and roots required for cropping gardens of given dimensions. The most approved mode of culture of the different kinds of vegetables and salads. The preparation of fermenting materials for artificial heating. The forcing of vegetables and salads.

84. Sect. III.—General subjects.—Soils, Water, Atmospheric Air, Light and Heat, in their relation to the successful cultivation of Fruit and Vegetables. Manures and their application. The Diseases and Insects to which Fruit-trees and Vegetables are subject, and their remedies. The erection, heating, and ventilation of garden structures.

85. Text Books:—Lindley's *Theory and Practice of Horticulture* (*Longmans*). The *Cottage Gardener's Dictionary* (*Bell and Daldy*). Hogg's *Fruit Manual*, 3rd edition (171, Fleet-street). Rivers' *Miniature Fruit Garden* (*Longmans*). Bréhaut's *Modern Peach Pruner* (171, Fleet-street).

XVIII.—ANIMAL PHYSIOLOGY IN RELATION TO HEALTH.

Examiner.—Dr. Michael Foster, Director of the Physiological Laboratory, and Teacher of Practical Physiology and Histology, University College, London.

86. The general principles of Animal Physiology, and the application of them to the preservation of health and the wants and emergencies of daily life.

87. Text Books:—Huxley's *Lessons in Elementary Physiology* (*Macmillan*). Carpenter's *Animal Physiology*, 1859 (*Bohn*). Mapother's *Physiology and the Principles of Disease* (*Longmans*). Mapother's *Lectures on Public Health* (*Longmans*). Lardner's *Animal Physics* (*Walton and Maberly*). Translation of Milne Edwards' *Manual of Zoology* (*Renshaw*). Marshall's *Descriptions of the Human Body*, with *Atlas* (*Day and Son*), for details of Anatomy.

88. The Examiner, speaking of last year's work, says:—"A large number of the candidates were more anxious to show that they had learned by heart a series of technical terms than to make it clear to the examiner that they really understood what they were writing about. There was too much book-work—too little reflection over what had been read. There were also many instances of bad spelling, not only of technical, but also of common words."

XIX.—DOMESTIC ECONOMY.

Examiner.—Edward Carleton Tufnell, Esq., one of Her Majesty's Inspectors of Schools.

89. Candidates will be expected to possess such a knowledge of the essential elements of Mechanical and

* Living plants are provided by the Society for this examination.

Chemical Physics, Chemistry,* and Physiology, and of the general outlines of Natural History, as may enable them to describe the origin and properties of the articles, and the rationale of the processes indicated or suggested by the following heads, as well as to explain the practical rules which science suggests for the promotion of health and comfort, and for turning limited means to the best advantage:

90. Dwellings for town or country; site, general design, details of parts, materials and processes of construction and decoration; fixtures and fittings; furniture, fabrics, and clothing; the philosophy of food based on the functions and requirements of the human frame, and on the chemical and hygienic properties of proximate constituents; unwholesome food; adulterations; preservation; condiments; culinary processes; refreshing, stimulating, and intoxicating beverages; fuel and other household stores; means for promoting a vigorous development of the frame, and for maintaining the healthy exercise of its functions; means of safety; the care of the sick; household management and accounts; best ways of investing savings and of providing against emergencies.

91. The questions will be comprehensively framed, so as to give to candidates a free scope for making evident the extent of their studies in the various departments of Domestic Economy. Sound practical notions of the most essential points throughout the whole range of subjects are desired, rather than a deep knowledge of a few of them.

92. Text Books:—Tegetmeier's Domestic Economy (*Home and Colonial School Society, Gray's Inn-road*). Healthy Dwellings, &c., a lecture by Henry Roberts, F.S.A. (*Ladies' Sanitary Association, 8, Pont-street, Belgrave-square*). The Useful Arts employed in the Construction of Dwelling-houses; in the Production of Clothing and of Food (*Longmans*). Lankester's Lectures on Food, 1st and 2nd Course. Tomlinson's Warming and Ventilating (*Weale's Series*). The necessary Physical, Chemical, and Physiological knowledge may be obtained from Chamber's Educational Course on the Sciences (*W. and R. Chambers*).

XX.—POLITICAL AND SOCIAL ECONOMY.

Examiner.—Charles Neate, Esq., M.A., M.P., late Professor of Political Economy in the University of Oxford.

93. The examination will be devoted to the study of Civil Government and Social Economy, as set forth in the 3rd and 4th books of Stephens' Commentaries on the Laws of England. N.B.—In order to meet the question of expense as regards this work, candidates are informed that the earlier editions, which are obtainable at a reduced price, may be used, so long as they are not earlier than the 3rd edition.†

94. Professor Fawcett's Manual of Political Economy (*Macmillan*) must be studied by those who desire to obtain first-class certificates.

XXI.—GEOGRAPHY.

Examiner.—Wm. Hughes, Esq., F.R.G.S., Professor of Geography in King's College, London.

95. Candidates must show a sound knowledge of Elementary Geography, physical and descriptive. Such knowledge must embrace an acquaintance with at least the outlines of the great natural features of the globe, the political divisions of countries, and the localities of towns and other places of importance. This knowledge will be looked for in fuller extent with regard to the British Islands, and the various portions of the British Empire, than with regard to other countries. The recent changes in the map of Europe—especially in the cases of Germany and Italy—with the altered relationships between the various German States, may also be referred to as amongst the topics that

prominently demand attention on the part of the geographical student. Australia, New Zealand, and Germany (the last-named with reference to the changes consequent on the war of 1866), are proposed as subjects for more especial study on the part of the intending candidates for the ensuing year's examinations. In evidence of the knowledge possessed regarding those regions, the candidate will be required to sketch, from memory, a map of any one of the Australian colonies, or of any single European country, that may be named by the examiner. Such sketches need not possess accuracy of detail, but should at least show the general direction of coast-lines, mountain-chains, or river-courses, with the localities and names of the principal towns.

96. Candidates who aim at the highest class of certificate should be also prepared to answer such questions upon Geography, in its relation to the Physical Sciences and the History of Mankind, as involve a general acquaintance with the subject of climate, the laws of Meteorology, the Distribution of Plants and Animals over the Globe, the leading outlines of Geology, the Ethnographic Division of the Human Race, and the commercial resources of different lands. This kind of knowledge is looked for, not in place of geographical knowledge of a more elementary kind, but as supplementary to it, and throughout based upon it.

97. Text Books:—Manual of Geography, by William Hughes (*Longmans*). Geography of British History, by William Hughes (*Longmans*). Guyot's Earth and Man (*Longmans*). Page's Introductory Text Book of Geology (*Blackwood*). The School Physical Atlas (*either Johnstone's, Phillips's, or that published by the National Society*).

98. The Examiner, speaking of last year's work, says:—"It cannot be too strongly impressed on intending candidates, that methodised study (as distinguished from merely desultory snatches at knowledge) is a condition indispensable to a high order of success."

XXII.—ENGLISH HISTORY.

Examiner.—The Rev. J. S. Brewer, M.A., Professor of Modern History in King's College, London.

99. English History and English Constitutional History.

100. Text Books:—Manual of English History, by Ross; or The Student's Hume. Creasy's English Constitution.

101. Special subject:—The Reign of Charles II. Lingard.

XXIII.—ENGLISH LITERATURE.

Examiner.—Rev. Samuel Clark, M.A., Chairman of the Board of Examiners.

102. Any two, but not more than two, of the authors in the following list may be taken up for examination:—Shakspeare—King Lear; King John; The Merchant of Venice. Chaucer—The Prologue; The Knight's Tale. Bacon—The Essays. Craik—Outlines of the History of the English Language.

103. Candidates are recommended to make a very careful study of the text of the authors they may select. The questions on each author will be divided into two sections, the first intended to test the candidate's acquaintance with the text, the second his knowledge of the subject matter, and his critical and literary information. Full marks will not be given for answers in the second section if those in the first section do not prove satisfactory. No marks will be given for anything beyond answers to the questions.

104. The Examiner, in speaking of last year's work, says:—"I regret to observe that, in spite of the repeated admonitions that have been given, there are some candidates who waste their time by copying out the questions on their papers."

XXIV.—LOGIC AND MENTAL SCIENCE.

Examiner.—J. D. Morell, Esq., LL.D., and one of Her Majesty's Inspectors of Schools.

105. Logic: Candidates will be expected to answer

* The use of symbols and equivalents will be optional.

† A limited number of copies of the 3rd edition are on sale at Messrs. Wildy and Son's, law booksellers, Lincoln's-Inn-gate-way, Carey-street, price £1 each.

questions on the different processes of thought, and the symbols by which they are expressed. Every candidate must be prepared to analyse examples of reasoning, and to detect fallacies.

106. Text Books:—Whateley's Elements of Logic, or Morell's Handbook of Logic.

107. A Candidate for a second or third-class Certificate will be expected to prepare, in addition, any one of the following books which he may select:—Mill's System of Logic, Book III., Of Induction; Dugald Stewart's Outlines of Moral Philosophy (McCosh's Edition); or Sir William Hamilton's Lectures on Metaphysics, Lectures xx. to xl.

108. A Candidate for a first-class Certificate will be expected to prepare any two of these works which he may select.

XXV.—LATIN AND ROMAN HISTORY.

Examiner.—Rev. F. Temple, D.D., Head Master of Rugby School.

109. Cicero; De Nat. Deorum Lib. 1. Ovid Metam. Lib. 1.

110. Roman History to the death of Augustus Cæsar. Text Book:—Liddell's History of Rome, in one volume.

XXVI.—FRENCH.

Examiner.—Alphonse Mariette, Esq., M.A., Professor of French, King's College, London.

111. The Examination Paper will be divided into three parts.

112. The first will comprise grammatical questions and an extract from a modern French writer, to be translated into English. Candidates merely aiming at a 3rd class certificate should confine themselves to this first part.

113. The second part will comprise, together with a few grammatical questions, an English extract to be translated into French, and a list of idiomatic expressions to be rendered from French into English, or vice versa. This should be done satisfactorily by the Candidate who aims at a 2nd class certificate.

114. In the third part, Candidates for a 1st class certificate will have to translate an English extract into French (to which great importance is attached), and to answer properly (in French) some elementary questions on the two following subjects:—

1. French literature during the fifteenth century, and first half of the sixteenth.

2. The History of France, from the accession of Charlemagne to the death of Louis IX. (768—1270).

115. Books recommended:—Mariette: Half-Hours of French Translation (*Williams and Norgate*, London and Edinburgh). Nisard: Histoire de la Littérature Française, vol. I. (*Williams and Norgate*), or Demogrot: Histoire de la Littérature Française (*Williams and Norgate*). Duruy: Histoire de France, vol. I. (*Williams and Norgate*).

XXVII.—GERMAN.

Examiner.—Dr. Wintzer, Teacher of German in King's College, London.

116. The Examination paper will consist of four sections. The first will contain extracts from the works recommended for reading; the second grammatical questions and idioms; the third English phrases, an extract from an English author (both to be turned into German); and the fourth, questions on a period of the history and literature of Germany (stated in par. 123, below), and a theme to be worked out in German.

117. Each candidate must translate at least one of the extracts in section 1, but Candidates for first-class certificates two, one from prose, the other from poetry. The latter must also translate well from English into German, answer in German a few questions on the literature and history of Germany, and write (in German) a well-expressed essay on a subject which will be announced to them when they come up for examination.

118. Books recommended:—*Schiller's Abfall der Niederlande* (book I.); *Marie Stuart* (acts I. and II.); *Göethe's Torquato Tasso* (acts I. and II.); *Kohrausch's Deutsche Geschichte* (sechster Zeitraum); *Karl V. bis zum westphälischen Frieden* (1520—1648); *Vilmar's Geschichte der Deutschen National Literatur*; *Alte Zeit bis zum Ende des sechsten (Lombardischen) Sagenkreises*.

XXVIII.—ITALIAN.

Examiner.—Signor Pistrucci, Professor of Italian in King's College, London.

119. Candidates for first-class certificates will be required—(1st.) To translate into English passages from some of the principal Italian poets and historians, and to answer the grammatical questions which may be added to those passages. (2nd.) They will also have to translate into Italian an extract from some English author; (3rd.) and turn a few familiar idioms into their equivalents, from Italian into English, and vice versa.

120. For second and third-class certificates Candidates will translate into English some selection from Metastasio's drammi, and Foscolo or Manzoni's prose works, and answer a certain number of grammatical questions.

XXIX.—SPANISH.

Examiner.—B. B. Aguirre, Esq., Lecturer on Spanish in King's College, London.

121. Candidates for a first-class certificate will have to translate an English passage into Spanish, to render into English or French several idiomatic phrases and to write in Spanish a short essay.

122. Candidates for a second-class certificate will have to translate from English into Spanish, and to answer several questions upon the Spanish verbs.

123. Candidates for a third-class certificate will have to translate from Spanish into English, and to answer several grammatical questions.

124. Books recommended:—Spanish Gil Blas; Conquesta de Méjico, por Dn. José Morales, Santisteban; Trozos escojidos delos mejores hablistas españoles, por Dn. Carlos Ochoa; Estudios filolójicos, por Dn. Manuel Martínez de Morentin.—Don Quixote translated into English by Charles Jarvis.

XXX.—FREEHAND DRAWING.

Examiner.—F. S. Cary, Esq.

125. In freehand drawing the Candidate will be required to show a practical knowledge of the principles usually applied in the imitation of natural and artificial forms, such as furniture, manufactured articles, ornament, foliage, and the human form.

126. The Examiner, in speaking of last year's work, says:—"The drawings are quite up to the general average, but the candidates have sadly failed in answering the four questions relating to the proportions of the human figure."

XXXI.—PRACTICAL GEOMETRY.

Examiner.—Thomas Bradley, Esq., Professor of Geometrical Drawing in King's College, London, and at the Royal Military Academy, Woolwich.

127. Practical Geometry, or Geometrical Drawing, is required by the Mechanic, Engineer, Builder, and all in any way employed in the arts of construction. The Candidates will be examined in Practical Plane Geometry, the construction of right line figures of given areas, and of curved lines required in the arts, &c.; in Practical Solid Geometry, Elementary Problems on the line and plane, in space, and their combinations, the representation by orthographic projection of simple solids from conditions; in the principles of Development as used in the construction of Maps, &c.; and in Elementary Perspective Projection as far as it is required by the Architect.

128. Text Books:—Geometry, Plane, Solid, and Spherical (*Library of Useful Knowledge*) is especially recommended as a work to be studied on Theoretical Geometry. Elements of Geometrical Drawing, published by the

Committee of Council on Education, two parts (*Chapman and Hall*). Hall's Elements of Descriptive Geometry for students in Engineering. Heather's Descriptive Geometry. Also the following French Works:—*Eléments de Géométrie Descriptive*, par S. F. Lacroix; *Traité de Géométrie Descriptive* par Lefebvre de Fourcy; *Nouveau Cours raisonné de Dessin Industriel*, par Armengaud, aîné, et Armengaud, jeune, et Amouroux; *Bardin's Works on Descriptive Geometry*.

129. The Examiner, speaking of last year's work, says that the numerous failures are "the result of the same causes which have been mentioned in previous reports—First, a want of elementary knowledge of practical co-ordinate geometry; and secondly, attempted constructions which the candidates should have felt were beyond their powers."

XXXII.—THEORY OF MUSIC.

Examiner.—John Hullah, Esq.

130. Notation, the modern modes, intervals, time signatures, the stave, transposition, modulation, terms and characters in common use.

131. The Elements of Harmony.

132. Musical History and Biography.

133. Arrangements must be made, in the Previous Examinations by the Local Boards, to test Candidates, by oral examination, in their knowledge or appreciation of the *sound* of musical successions and combinations. A form of the test to be used for this purpose by the Local Board at the Previous Examination, will be sent by the Council to such Local Boards as may apply for it in due time before the Previous Examination.

PRIZES FOR 1868.

THE PRINCE CONSORT'S PRIZE.

134. His Royal Highness, the late President of the Society, was pleased to offer annually to the candidate who, obtaining a certificate of the first-class in the current year, shall have obtained, in that year and the three years immediately preceding it, the greatest number of such certificates, a PRIZE of TWENTY-FIVE GUINEAS, and this Prize Her Majesty the Queen has graciously intimated her intention to continue. This Prize cannot be taken more than once by the same candidate. It will be accompanied by a certificate from the Society of Arts, setting forth the special character of the Prize, and the various certificates for which it was granted.

GENERAL PRIZES.

. None of these Prizes will be awarded to a Candidate who does not obtain a Certificate of the First-class in the subject.

1. Arithmetic (F)	{ First Prize, £5. Second Prize, £3.	17.*Fruit and Vegetable Culture { First Prize, £5. Second Prize, £3.
2. Book-keeping (F)	{ First Prize, £5. Second Prize, £3.	18. Animal Physiology in relation to Health (F)..... { First Prize, £5. Second Prize, £3.
3. Algebra	{ First Prize, £5. Second Prize, £3.	19.*Domestic Economy (F)..... { First Prize, £5. Second Prize, £3.
4. Geometry	{ First Prize, £5. Second Prize, £3.	20.*Political and Social Economy { First Prize, £5. (F) { Second Prize, £3.
5. Mensuration	{ First Prize, £5. Second Prize, £3.	21.*Geography (F) { First Prize, £5. Second Prize, £3.
6. Trigonometry.....	{ First Prize, £5. Second Prize, £3.	22. English History (F) { First Prize, £5. Second Prize, £3.
7. Conic Sections	{ First Prize, £5. Second Prize, £3.	23. English Literature (F) { First Prize, £5. Second Prize, £3.
8. Navigation and Nautical Astronomy	{ First Prize, £5. Second Prize, £3.	24. Logic and Mental Science .. { First Prize, £5. Second Prize, £3.
9. Principles of Mechanics	{ First Prize, £5. Second Prize, £3.	25. Latin and Roman History .. { First Prize, £5. Second Prize, £3.
10. Practical Mechanics	{ First Prize, £5. Second Prize, £3.	26. French (F) { First Prize, £5. Second Prize, £3.
11. Electricity and Magnetism ..	{ First Prize, £5. Second Prize, £3.	27. German (F)..... { First Prize, £5. Second Prize, £3.
12. Light and Heat	{ First Prize, £5. Second Prize, £3.	28. Italian (F) { First Prize, £5. Second Prize, £3.
13. Chemistry	{ First Prize, £5. Second Prize, £3.	29. Spanish (F)..... { First Prize, £5. Second Prize, £3.
14. Mining and Metallurgy	{ First Prize, £5. Second Prize, £3.	30. Freehand Drawing (F)..... { First Prize, £5. Second Prize, £3.
15.*Botany	{ First Prize, £5. Second Prize, £3.	31. Geometrical Drawing (F).... { First Prize, £5. Second Prize, £3.
16.*Floriculture	{ First Prize, £5. Second Prize, £3.	32. Theory of Music (F)..... { First Prize, £5. Second Prize, £3.